

Installation and Start-Up Instructions

NOTE: Read entire instruction before beginning installation.

SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warning or cautions attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol \triangle . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal word— DANGER, WARNING, or CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

\triangle WARNING

Before installation or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable. Electrical shock can cause personal injury or death.

INSTALLATION

Step 1—Check Equipment

Unpack unit and move to final location. Remove carton taking care not to damage unit.

Inspect equipment for damage prior to installation. File claim with shipping company if shipment is damaged or incomplete. Locate rating plate on unit. It contains information needed to properly install unit. Check rating plate to be sure unit matches job specifications.

Step 2—Install on a Solid, Level Mounting Pad

If conditions or local codes require the unit be attached to pad, tiedown bolts should be used and fastened through mounting feet provided in unit base. Refer to unit mounting pattern to determine base size and knockout hole locations. (See Fig. 2.)

Allow sufficient space for airflow clearance, wiring, refrigerant piping and servicing of unit. Locate unit so condenser airflow is unrestricted on both sides. A minimum 6-in. (152mm) clearance above and 6 ft (1.83m) between units must be maintained. (See Fig. 2.)

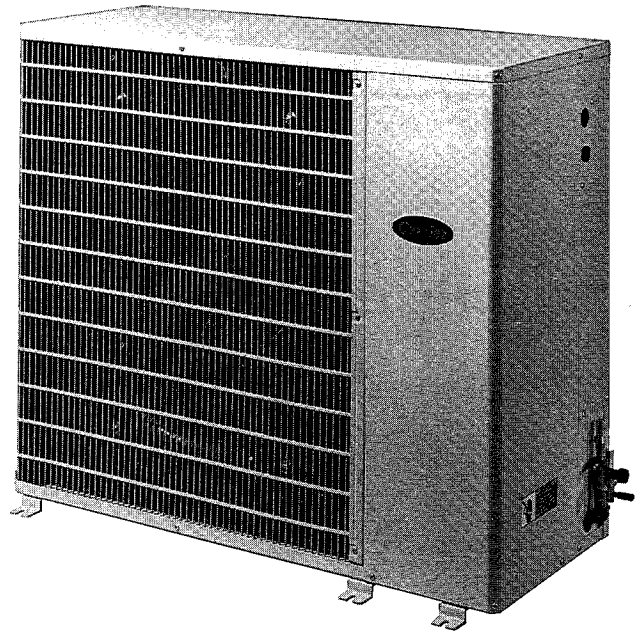


Fig. 1—Model 38QRA

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Unit may be mounted on a level pad directly on base legs or mounted on accessory snow stand at support points. See Fig. 2 and 4 for center of gravity. Position unit so water or ice from roof cannot drop directly onto unit.

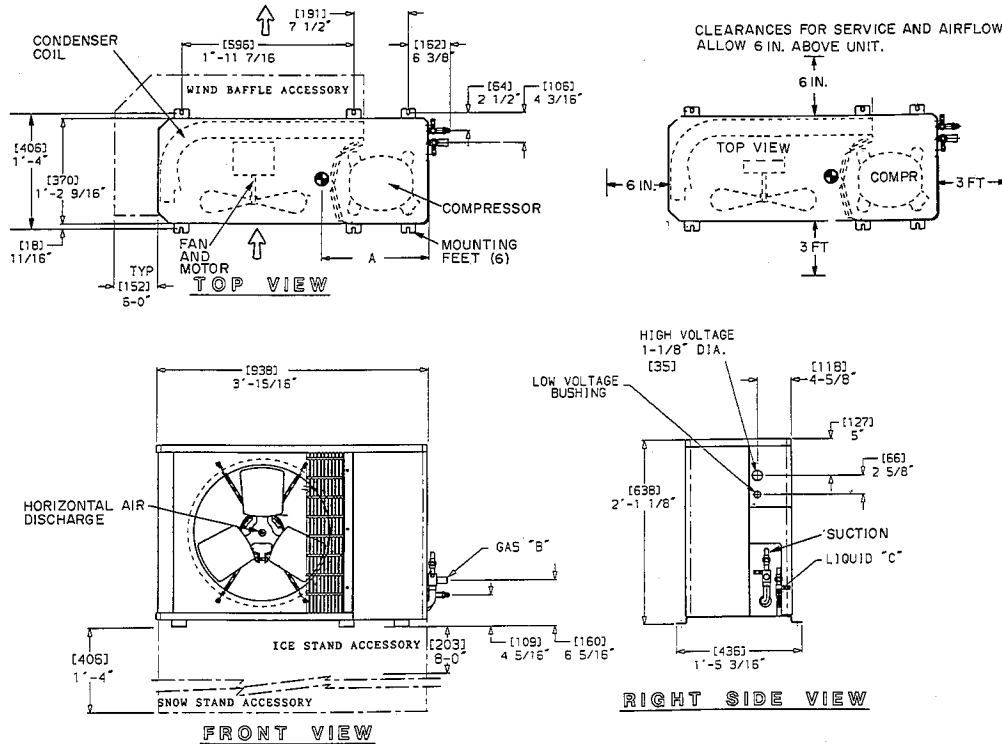
Step 3—Elevate Unit

For proper drainage the heat pump must be raised off the mounting surface. Use accessory snow rack or ice stand where prolonged subfreezing temperatures or heavy snow occur. Refer to separate installation instructions packaged with these accessories.

In rooftop applications, locate unit at least 6 in. (152mm) above roof surface on a level platform or frame. Place unit above a load-bearing wall and isolate unit and tubing set from structure. Arrange supporting members to adequately support unit and minimize transmission of vibration to building. Consult local codes governing rooftop applications.

RIGGING

When lifting unit for rooftop mounting, keep unit upright. Lift unit using a sling. Use cardboard or padding under sling, and spreader bars to prevent sling damage to unit. (See Fig. 4.) See Figs. 2 and 4 for center of gravity reference. Install unit so that coil does not face into prevailing winds. If this cannot be done, and constant



A90304

UNIT SIZE	A		B		C	
	In.	(mm)	In.	(mm)	In.	(mm)
018—036 1 Ø	16	406.4	36-15/16	938.2	23-7/16	595.3
036 3 Ø	18-7/16	468.3	44-9/16	1131.9	30-1/2	774.7
048—060 1 & 3 Ø	18-7/16	468.3	44-9/16	1131.9	30-1/2	774.7

Fig. 2—Dimensional Drawing—38QRA018—060

winds above 25 mph are expected, use Accessory Wind Baffle, part number KSAWB0101AAA or KSAWB0201AAA. See instructions provided with accessory kit for installation.

⚠ CAUTION

Be sure unit panels are securely in place prior to rigging.

Step 4—Replace Indoor AccuRater® Piston, if required

Check indoor coil piston to see if it matches the required piston shown on unit rating plate. If it does not match, replace indoor coil piston with piston shipped with this unit. (See Fig. 5.) The piston shipped with outdoor unit is correct for any approved indoor coil combination. Note that Type A pistons are used on indoor units and Type B pistons are used on 38QRA outdoor units. Do not interchange piston types. (See Fig. 5.) For optimum cyclic performance, installation of liquid solenoid valve is recommended. Consult local distributor for liquid solenoid valve kit and hard start kit part number, if required.

Table 1—Minimum Mounting Pad Dimensions

UNIT SIZE	SUPPORT FEET		SNOW STAND		ICE STAND	
	In.	(mm)	In.	(mm)	In.	(mm)
018—036 1 Ø	23 x 42	584.2 x 1066.8	26 x 42	660.4 x 1066.8	26 x 42	660.4 x 1066.8
036 3 Ø	24 x 50	609.6 x 1270.0	28 x 50	711.2 x 1270.0	26 x 50	660.4 x 1270.0
048—060 1 and 3 Ø	24 x 50	609.6 x 1270.0	28 x 50	711.2 x 1270.0	26 x 50	660.4 x 1270.0

▲ CAUTION

DO NOT BURY MORE THAN 36 IN. (914mm) OF REFRIGERANT TUBING IN GROUND. If any section of tubing is buried, there must be a 6-in.(152mm) vertical rise to the valve connections on the outdoor unit. If more than the recommended length is buried, refrigerant may migrate to cooler buried section during extended periods of unit shut-down, causing refrigerant slugging and possible compressor damage at start-up.

Step 5—Make Piping Connections

Outdoor units may be connected to indoor sections using accessory tubing package or field-supplied tubing of refrigerant grade, correct size, and condition. The liquid- and vapor-tube diameters can be determined by using Table 3. For tubing requirements beyond 50 ft (15.24m), obtain information from your local distributor.

If either refrigerant tubing or indoor coil is exposed to atmospheric conditions for longer than 5 minutes, it must be evacuated to 1000 microns to eliminate contamination and moisture in the system.

Run refrigerant tubes as directly as possible, avoiding unnecessary turns and bends. Suspend refrigerant tubes so they do not damage insulation on vapor tube and do not transmit vibration to the structure. Also, when passing refrigerant tubes through the wall, seal opening so vibration is not transmitted to structure. Leave some slack in refrigerant tubes between structure and unit to absorb vibration.

OUTDOOR UNIT CONNECTED TO FACTORY APPROVED INDOOR UNIT – Outdoor unit contains holding refrigerant charge only. See Table 2 for correct system charge when connected by 25 ft (7.62m) of field-supplied or factory accessory tubing. Add charge as required to achieve correct total. For long line application information, contact your local distributor.

Table 2—Refrigerant Charge

OUTDOOR UNIT	PHASE	CHARGE (LB)
018	1	4.25
024	1	4.75
030	1	6.00
036	1	7.00
036	3	11.63
048	1 & 3	9.44
060	1 & 3	11.75

Table 3—Refrigerant Connections and Recommended Liquid and Vapor Tube Diameters (In.)

UNIT SIZE	LIQUID		VAPOR	
	Connect Dia	Tube Dia	Connect Dia	Tube Dia
018,024,030	3/8	3/8	5/8	5/8
036	3/8	3/8	3/4	3/4
048	3/8	3/8	7/8	7/8
060	3/8	3/8	7/8	1-1/8

Tube diameters are for lengths up to 50 ft. For tubing lengths greater than 50 ft, consult Long-Line Application Guideline.

REFRIGERANT TUBING – Connect tubing to fittings on outdoor unit vapor and liquid service valves. (See Fig. 2.) Remove brass piston retainer. Insert outdoor piston shipped in bag with indoor piston in the liquid service valve, replace brass piston retainer and connect sweat adapter provided. (See Fig. 5.)



CARRIER CORP. INDIANAPOLIS, IN 46206			
PRODUCT NO.			SUITABLE FOR OUTDOOR USE
MODEL NO.			REFRIGERANT:
SERIAL NO.			R-22
DESIGN/TEST PRESSURE GAGE			HOLDING CHARGE
HIGH [PSI]	300	kPa	2068
LOW [PSI]	150	kPa	1034
	VOLTS AC	PHI	HZ
COMPRESSOR		RA	LA
		PISTON	
	VOLTS AC	PHI	HZ
FAN MOTOR		FLA	
POWER SUPPLY	VOLTS		PHI HZ
VOLTAGE RANGE		MAX	MIN
MIN CKT. AMP		MAX. FUSE/HACR TYPE	CB AMP
CHARGE SYSTEM PER INSTALLATION INSTRUCTIONS			
UL		CERTIFICATION APPLIES ONLY WHEN THE COMPLETE SYSTEM IS LISTED WITH ART	
SA		 	
MADE IN MEXICO		317204-401 REV. A	

Fig. 3—Unit Rating Plate

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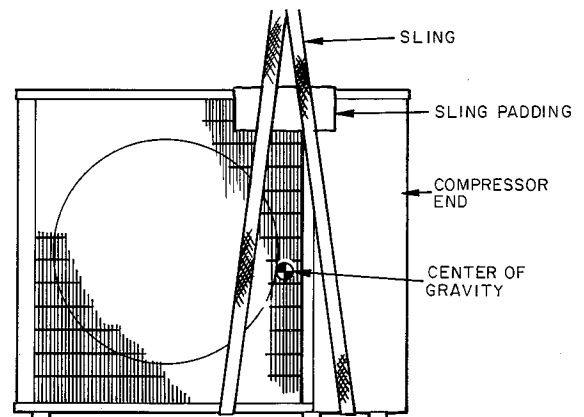


Fig. 4—Rigging

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▲ CAUTION

A brazing shield **MUST** be used when tubing sets are being brazed to the service valves to prevent damage to the painted unit surface.

▲ CAUTION

To avoid valve damage while brazing, service valves must be wrapped with a heat-sinking material such as a wet cloth.

FILTER DRIER – Install in field liquid line, if used.

SWEAT CONNECTION – Use refrigerant grade tubing. Service valves are closed from factory and ready for brazing. After wrapping the service valve with a wet cloth, the tubing set can be brazed to the service valve using either silver bearing or non-silver bearing brazing material. Consult local code requirements. Refrigerant tubing and indoor coil are now ready for leak testing. This check should include all field and factory joints.

NOTE: Unit is shipped with R-22 factory holding charge indicated on unit rating plate.

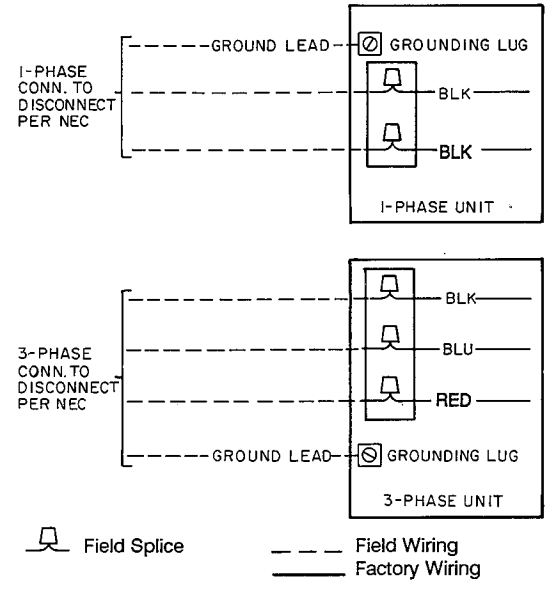
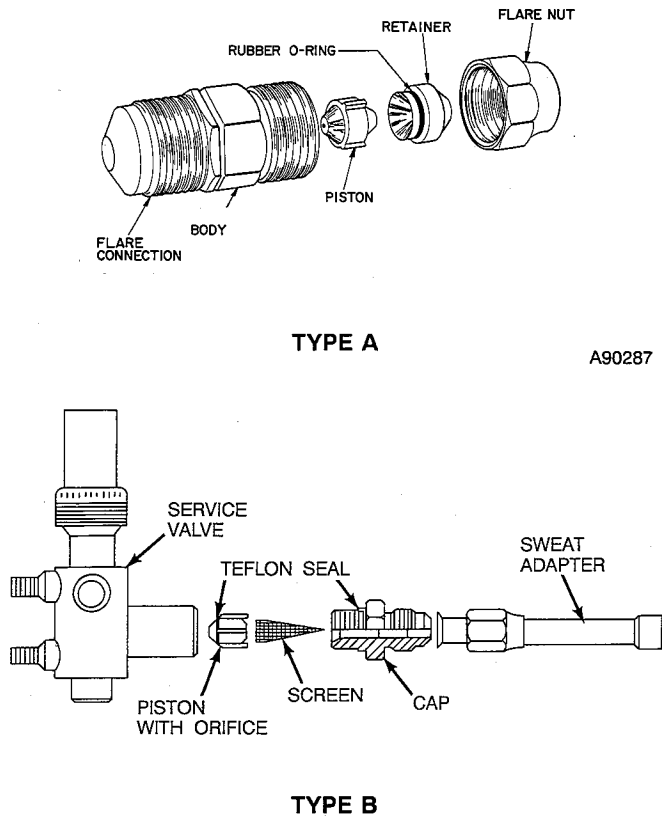


Fig. 6—Line Power Connections

Fig. 5—AccuRater® (Bypass Type Component)

Step 6—Make Electrical Connections

Be sure field wiring complies with local and national fire, safety and electrical codes, and voltage to system is within limits shown on unit rating plate. Contact local power company for correction of improper voltage. See unit rating plate for recommended circuit protection device and minimum circuit amps for wire size.

NOTE: Operation of unit on improper line voltage constitutes abuse and could affect unit reliability. See unit rating plate. Do not install unit in system where voltage may fluctuate above or below permissible limits.

NOTE: Use copper wire only between disconnect switch and unit.

BRANCH CIRCUIT DISCONNECT — Install branch circuit disconnect per NEC of adequate size to handle unit starting current. Locate disconnect within sight from and readily accessible from unit, per Section 440-14 of NEC.

⚠ WARNING

According to NEC, ANSI/NFPA 70, and local codes, the cabinet must have an uninterrupted or unbroken ground, to minimize personal injury if an electrical fault should occur. The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes. Failure to follow this warning could result in an electric shock, fire, or death.

GROUND AND POWER WIRES — Route power wires through opening in unit side panel and connect in unit control box as shown on unit wiring label and Fig. 6. Unit must be grounded.

CONTROL CIRCUIT WIRING — Control voltage is 24 volts (40 va minimum). See Fig. 7 and unit wiring label for field-supplied wiring details. Route control wires through opening in unit side panel to connection in unit control box. Use furnace or fan coil transformer as 24 volt (40 va minimum) supply for system or use accessory transformer.

NOTE: Use No. 18 AWG color-coded, insulated (35 C minimum) wires. If thermostat is located more than 100 ft from unit (as measured along the control voltage wires), use No. 16 AWG color-coded wires to avoid excessive voltage drop.

NOTE: The defrost timer is factory set for 90-minute cycles. The timer can be field set for 30- and 50-minute cycles depending on defrost conditions in your geographical location.

Step 7—Install Electrical Accessories

Refer to the individual instructions packaged with kits or accessories when installing.

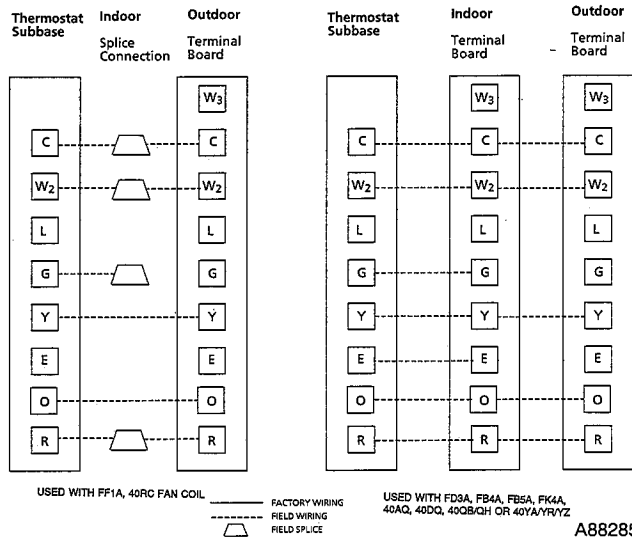
See your local distributor or dealer for specific component information.

Step 8—Start-Up

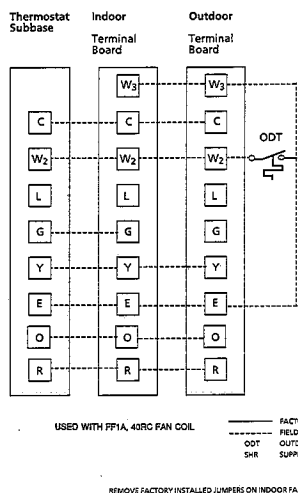
1. When equipped with a crankcase heater, energize crankcase heater a minimum of 24 hours before starting unit. To energize heater only, set thermostat at OFF position and close electrical disconnect to outdoor unit.
2. Fully back seat (open) liquid- and vapor-tube service valves.
3. Unit is shipped with valve stem(s) front seated and caps installed. Replace stem caps after system is opened to refrigerant flow (back seated). Replace caps finger tight plus 1/6-turn.
4. Close electrical disconnects to energize system.
5. Set room thermostat at desired temperature.
6. Set room thermostat at HEAT or COOL and fan switch at ON or AUTO, as desired. Operate unit for 15 minutes.

SEQUENCE OF OPERATION — With power supplied to indoor and outdoor units, transformer and crankcase heater are energized.

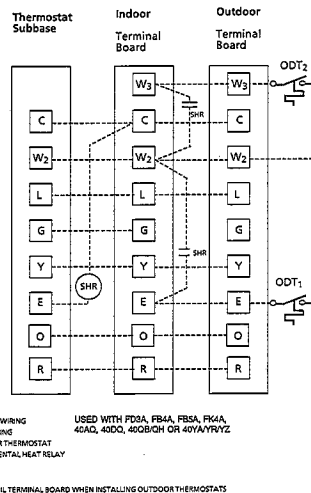
SYSTEMS WITHOUT OUTDOOR THERMOSTATS



SYSTEMS WITH ONE OUTDOOR THERMOSTAT



SYSTEMS WITH TWO OUTDOOR THERMOSTATS



REMOVE FACTORY INSTALLED JUMPERS ON INDOOR FAN COIL TERMINAL BOARD WHEN INSTALLING OUTDOOR THERMOSTATS

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Fig. 7—Typical Circuit Connections

Cooling

On a "call for cooling", the thermostat "makes" circuits R-O, R-Y and R-G. Circuit R-O energizes the reversing valve, switching it to cooling position. Circuit R-Y energizes the contactor, starting outdoor fan motor and compressor circuit. R-G energizes the indoor unit blower relay, starting the indoor blower motor on high speed.

When the thermostat is satisfied, its contacts open, de-energizing the contactor and blower relay. Compressor and motors should stop.

Heating

On a "call for heating", the thermostat "makes" circuits R-Y and R-G. Circuit R-Y energizes contactor, starting outdoor fan motor and compressor. Circuit R-G energizes the indoor blower relay, starting the blower motor on high speed.

Should the temperature continue to fall, R-W2 is made through the second-stage room thermostat bulb. Circuit R-W2 energizes a sequencer, bringing on the first bank of supplemental electric heat and providing electrical potential to the second heater sequencer (if used). If the outdoor temperature falls below the setting of the outdoor thermostat, (field-installed operation) the contacts close to complete the circuit and bring on the second bank of supplemental electric heat.

When the thermostat is satisfied, its contacts open, de-energizing the contactor and sequencer. All heaters and motors should stop.

Defrost

The defrost control is a time/temperature control which includes a field-selectable time period between defrost cycles (30, 50 and 90 minutes, factory set at 90 minutes). Quick connects are located at board edge.

The electronic timer and the defrost cycle will start only when the contactor is energized, defrost thermostat is closed and the timing device has completed one cycle.

The defrost mode is identical to the cooling mode except that the outdoor fan motor stops and second stage heat is turned on to continue warming the conditioned space.

⚠ WARNING

Service valve gage ports are not equipped with Schrader valves. To prevent personal injury, make sure gage manifold is connected to the valve gage ports before moving valves off fully back seated position. Wear safety glasses and gloves when handling refrigerant.

⚠ CAUTION

Compressor damage may occur if system is overcharged.

Step 9—Refrigerant Charging

NOTE: See Table 2 for correct system charge of tested combination.

Cooling

To check and adjust charge during cooling season, use Tables 4 and 5 and the following procedure:

1. Operate unit a minimum of 15 minutes before checking charge.
2. Measure suction pressure by attaching a gage to suction valve service port.

**Table 4—Superheat Charging Table
(Superheat Entering Suction Service Valve)**

OUTDOOR TEMP	INDOOR COIL ENTERING AIR (F) WB													
	50	52	54	56	58	60	62	64	66	68	70	72	74	76
55	9	12	14	17	20	23	26	29	32	35	37	40	42	45
60	7	10	12	15	18	21	24	27	30	33	35	38	40	43
65	—	6	10	13	16	19	21	24	27	30	33	36	38	41
70	—	—	7	10	13	16	19	21	24	27	30	33	36	39
75	—	—	—	6	9	12	15	18	21	24	28	31	34	37
80	—	—	—	—	5	8	12	15	18	21	25	28	31	35
85	—	—	—	—	—	—	8	11	15	19	22	26	30	33
90	—	—	—	—	—	—	—	5	9	13	16	20	24	27
95	—	—	—	—	—	—	—	—	6	10	14	18	22	25
100	—	—	—	—	—	—	—	—	—	8	12	15	20	23
105	—	—	—	—	—	—	—	—	—	—	5	9	13	17
110	—	—	—	—	—	—	—	—	—	—	—	6	11	15
115	—	—	—	—	—	—	—	—	—	—	—	—	8	14

—Do not attempt to charge system under these conditions or refrigerant slugging may occur.

3. Measure suction line temperature by attaching a service thermometer to unit suction line near suction valve. Insulate thermometer for accurate readings.
4. Measure outdoor coil inlet air dry-bulb temperature with a second thermometer.
5. Measure indoor coil inlet air wet-bulb temperature with a sling psychrometer.

6. Using Table 4, find air temperature entering outdoor coil and wet-bulb temperature entering indoor coil. At this intersection note the superheat.

⚠ CAUTION

To prevent personal injury, wear safety glasses and gloves when handling refrigerant. Do not overcharge system. This can cause compressor flooding.

⚠ CAUTION

Service valves must be fully back seated to close service port. There is no Schrader valve at the service port and failure to back seat the valve could result in loss of system charge or personal injury.

7. Using Table 5, find superheat temperature and suction pressure; note suction line temperature.
8. If unit has higher suction line temperature than charted temperature, add refrigerant until charted temperature is reached (+/- 3 F).
9. If unit has lower suction line temperature than charted temperature, bleed refrigerant until charted temperature is reached (+/- 3 F).
10. If air temperature entering outdoor coil or pressure at suction valve changes, charge to new suction line temperature indicated in chart.
11. This procedure is valid, independent of indoor air quantity.

**Table 5—Required Suction Tube Temperature (F)
(Entering Suction Service Valve)**

SUPERHEAT TEMP(F)	SUCTION PRESSURE AT SERVICE PORT (PSIG)								
	61.5	64.2	67.1	70.0	73.0	76.0	79.2	82.4	85.7
0	35	37	39	41	43	45	47	49	51
2	37	39	41	43	45	47	49	51	53
4	39	41	43	45	47	49	51	53	55
6	41	43	45	47	49	51	53	55	57
8	43	45	47	49	51	53	55	57	59
10	45	47	49	51	53	55	57	59	61
12	47	49	51	53	55	57	59	61	63
14	49	51	53	55	57	59	61	63	65
16	51	53	55	57	59	61	63	65	67
18	53	55	57	59	61	63	65	67	69
20	55	57	59	61	63	65	67	69	71
22	57	59	61	63	65	67	69	71	73
24	59	61	63	65	67	69	71	73	75
26	61	63	65	67	69	71	73	75	77
28	63	65	67	69	71	73	75	77	79
30	65	67	69	71	73	75	77	79	81
32	67	69	71	73	75	77	79	81	83
34	69	71	73	75	77	79	81	83	85
36	71	73	75	77	79	81	83	85	87
38	73	75	77	79	81	83	85	87	89
40	75	77	79	81	83	85	87	89	91

Heating

To check system operation during heating cycle, use Table 6. This table indicates whether a correct relationship exists between system operating pressure and air temperatures entering indoor and outdoor units. In heating mode, check should be made approximately 15 minutes after defrost with unit running with a clean coil. If pressure and temperature do not match on chart, system refrigerant charge may not be correct or other system abnormalities may exist. Do not use table to adjust refrigerant charge.

When recharging is necessary during heating season, weigh in total charge as indicated in Table 2. Remove or recycle any refrigerant remaining in system before recharging. If the system has lost complete charge, evacuate and recharge by weight. Service port connections are provided on liquid- and suction-line service valves. For evacuation and recharging, Dial-a-Charge charging cylinder, or similar device, is an accurate device for recharging system by weight.

CARE AND MAINTENANCE

For continuing high performance, and to minimize possible equipment failure, it is essential that periodic maintenance be performed on this equipment. Consult your servicing contractor or users manual for the proper frequency of maintenance. Frequency of maintenance may vary depending upon geographic areas, such as coastal applications.

Table 6—Heating Check Chart

HEATING OPERATION PRESSURE TABLE, FIXED RESTRICTOR (HIGH PRESSURE AT SUCTION VALVE, LOW PRESSURE AT LIQUID VALVE, SUCTION PRESSURE AT COMPRESSOR)									
Unit 38QRA	Indoor Dry Bulb Temp (F)	Outdoor Temperature (F) Dry Bulb							
			60	50	40	30	20	10	0
018	60	High	231.0	208.3	185.6	174.2	162.8	151.4	140.0
		Low	80.4	70.6	60.8	53.7	46.6	39.5	32.4
		Suction	66.8	57.9	49.0	42.9	36.8	30.7	24.6
	70	High	257.0	231.6	206.1	194.1	182.1	170.0	158.0
		Low	84.5	73.2	61.9	54.4	46.8	39.3	31.7
		Suction	70.5	60.0	49.5	43.2	36.8	30.5	24.1
	80	High	288.0	260.0	232.0	218.8	205.5	192.3	179.0
		Low	87.6	75.6	63.6	55.6	47.6	39.6	31.6
		Suction	73.4	62.5	51.6	44.7	37.9	31.0	24.1
024	60	High	226.9	203.2	179.4	155.0	148.2	141.5	134.5
		Low	79.1	67.8	56.5	44.9	40.0	35.2	30.2
		Suction	67.2	56.9	46.7	36.1	31.9	27.7	23.4
	70	High	254.2	222.1	189.9	156.8	155.3	153.8	152.3
		Low	83.1	65.8	48.5	30.6	29.6	28.6	27.5
		Suction	70.7	55.1	39.5	23.4	22.7	21.9	21.2
	80	High	279.9	251.3	222.6	193.1	153.7	114.4	73.8
		Low	85.7	70.9	56.2	41.0	36.5	32.1	27.5
		Suction	72.7	59.4	46.2	32.5	28.8	25.1	21.4
030	60	High	157.7	151.3	144.9	138.3	132.2	126.0	119.7
		Low	64.9	58.9	53.0	46.8	40.1	33.4	26.5
		Suction	48.2	43.1	37.9	32.6	27.3	22.0	16.5
	70	High	186.6	177.5	168.4	159.0	153.4	147.8	142.1
		Low	70.0	62.1	54.2	46.0	40.4	34.7	28.9
		Suction	52.7	45.8	38.9	31.8	27.4	23.0	18.4
	80	High	216.0	205.3	194.7	183.7	177.4	171.2	164.7
		Low	74.5	65.0	55.6	45.8	39.9	34.1	28.0
		Suction	56.2	48.0	39.9	31.5	26.9	22.3	17.6
036 1 Phase	60	High	226.1	219.6	213.0	206.3	183.0	159.6	135.6
		Low	117.7	110.8	103.9	96.8	84.6	72.4	59.8
		Suction	65.3	55.4	45.6	35.4	30.2	25.0	19.6
	70	High	252.0	230.3	208.5	186.1	177.2	168.3	159.1
		Low	130.2	118.3	106.4	94.2	85.3	76.4	67.3
		Suction	65.8	56.5	47.3	37.7	32.2	26.6	20.9
	80	High	282.3	241.3	200.3	158.0	167.5	177.0	186.8
		Low	144.8	121.4	97.9	73.8	74.8	75.8	76.9
		Suction	67.3	56.9	46.4	35.7	31.5	27.3	23.0
036 3 Phase	60	High	193.7	180.4	167.0	153.3	145.8	138.3	130.6
		Low	71.4	64.4	57.5	50.3	42.1	33.9	25.5
		Suction	58.1	52.3	46.6	40.6	33.6	26.7	19.5
	70	High	227.8	200.1	172.4	143.9	144.9	145.8	146.8
		Low	79.7	94.6	109.5	124.9	92.4	59.8	26.3
		Suction	65.7	61.1	56.6	51.9	41.4	30.8	20.0
	80	High	235.4	222.6	209.9	196.7	187.5	178.4	168.9
		Low	106.7	88.3	69.9	50.9	42.9	34.9	26.7
		Suction	72.7	62.9	53.0	42.9	35.5	28.1	20.5

Table 6—Heating Check Chart Cont'd

HEATING OPERATION PRESSURE TABLE, FIXED RESTRICTOR (HIGH PRESSURE AT SUCTION VALVE, LOW PRESSURE AT LIQUID VALVE, SUCTION PRESSURE AT COMPRESSOR)									
Unit 38QRA	Indoor Dry Bulb Temp (F)	Outdoor Temperature (F) Dry Bulb							
			60	50	40	30	20	10	0
048	60	High	273.5	239.3	205.2	170.0	170.0	170.1	170.1
		Low	82.9	71.3	59.7	47.7	42.2	36.6	30.9
		Suction	68.3	57.6	47.0	36.0	31.8	2.6	23.2
	70	High	295.2	256.7	218.2	178.5	178.7	179.0	179.2
		Low	85.2	71.1	57.1	42.6	38.7	34.9	30.9
		Suction	69.5	56.9	44.3	31.3	28.5	25.8	22.9
	80	High	314.5	274.0	233.5	191.8	194.3	196.9	199.5
		Low	87.2	70.9	54.6	37.8	35.6	33.4	31.1
		Suction	70.6	56.1	41.7	26.8	25.5	24.2	22.9
060	60	High	228.9	210.7	192.5	173.8	161.5	149.2	136.6
		Low	85.9	74.1	62.2	50.0	41.3	32.5	23.5
		Suction	63.3	54.6	45.8	36.8	30.2	23.6	16.8
	70	High	258.3	238.7	219.2	199.0	184.9	170.9	156.4
		Low	86.9	74.9	62.9	50.5	41.8	33.0	24.0
		Suction	65.1	56.1	47.0	37.7	31.0	24.4	17.5
	80	High	290.0	268.7	247.4	225.5	209.6	193.6	177.2
		Low	88.4	76.0	63.7	50.9	42.2	33.5	24.5
		Suction	66.5	57.3	48.2	38.7	31.9	25.2	18.2